

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

#### (PCT Article 36 and Rule 70)

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Applicant's or agent's file reference<br>BW342M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>FOR FURTHER ACTION</b><br>See Form PCT/IPEA/416                         |                                                                                       |
| International application No.<br>PCT/IT2004/000527                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | International filing date ( <i>day/month/year</i> )<br>27.09.2004          | Priority date ( <i>day/month/year</i> )<br>29.09.2003                                 |
| International Patent Classification (IPC) or national classification and IPC<br>G01B7/13, G01B11/12, G01B21/14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                            |                                                                                       |
| Applicant<br>TENARIS CONNECTIONS AG et al.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                            |                                                                                       |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of 3 sheets, as follows:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</li> <li><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</li> </ul> <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> |                                                                            |                                                                                       |
| <p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the opinion</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                            |                                                                                       |
| Date of submission of the demand<br>18.07.2005                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Date of completion of this report<br>15.11.2005                            |                                                                                       |
| Name and mailing address of the international preliminary examining authority:<br><br>European Patent Office<br>D-80298 Munich<br>Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br>Fax: +49 89 2399 - 4465                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Authorized Officer<br><br>Grand, J-Y<br><br>Telephone No. +49 89 2399-2472 |  |

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INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY

International application No.  
PCT/IT2004/000527

IAP20 Rec'd PCT/IPTO 16 MAR 2006

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
    - international search (under Rules 12.3 and 23.1(b))
    - publication of the international application (under Rule 12.4)
    - international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

Description, Pages

1-6 as originally filed

Claims, Numbers

1-12 received on 18.07.2005 with letter of 12.07.2005

Drawings, Sheets

1/4-4/4 as originally filed

a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3.  The amendments have resulted in the cancellation of:

- the description, pages
- the claims, Nos.
- the drawings, sheets/figs
- the sequence listing (*specify*):
- any table(s) related to sequence listing (*specify*):

4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- the description, pages
- the claims, Nos.
- the drawings, sheets/figs
- the sequence listing (*specify*):
- any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/IT2004/000527

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

|                               |      |        |        |
|-------------------------------|------|--------|--------|
| Novelty (N)                   | Yes: | Claims | 1-9,12 |
|                               | No:  | Claims | 10,11  |
| Inventive step (IS)           | Yes: | Claims | 1-9    |
|                               | No:  | Claims | 10-12  |
| Industrial applicability (IA) | Yes: | Claims | 1-12   |
|                               | No:  | Claims |        |

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

PCT/IT2004/000527

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability.**

Reference is made to the following documents:

D1 = US-B1-6 289 600

D2 = JP-A-05 240621

D3 = US-A-2 587 774

D4 = JP-A-05 240620

**1. Independent apparatus claim 1**

The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses (the references in parentheses applying to this document);

- An apparatus (title and fig. 9) for measuring the internal and external profile (col. 7, l. 50-52) of metal pipes ends, comprising two pairs of sensors ("lasers (163, 166, 173, 176)") for measuring the distance from the external profile ("outer surface" in col. 7, l. 50-52, col. 7, l. 8-9 and col. 8, l. 8-9) and from the internal profile ("inner surface"), wherein the sensors are mounted on a support ("bracket (25)" in fig. 9) orthogonal to the theoretical axis of the pipe (fig. 9) and rotatable around its axis of rotation (col. 8, l. 6-8), there being provided means for carrying vertically the axis of rotation ("robot (10, 12)") next to the theoretical axis (col. 7, l. 58-62), and means for recording the measure data taken for each polar coordinate relevant to the instantaneous angular position of the sensors ("program" in col. 8, l. 8-10) during rotation of the support driven by motor means, in correspondence of means for detecting the angular position ("wrist encoder (78)" in col. 3, l. 37-39 and col. 8, l. 10-13).

The subject-matter of claim 1 differs from this known apparatus in that;

- The support of the sensors is mounted at the end of an internally hollow spindle which is driven at the opposite end by means in order to be drawn into rotation with respect to;
- A slide member which is vertically movable for changing the height of the axis of rotation thereof and slidable in a direction parallel to the axis.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The objective technical problem to be solved by the present invention may be regarded as to provide 3D-positioning of the sensors.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

The documents D2 and D4 do not disclose a hollow spindle nor a slide member. The

document D3 discloses a hollow spindle (18) but is totally silent about a slide member. Therefore, faced with the objective problem and having only D2, D3 or D4 at his disposal and using his common general knowledge, the skilled person has no incentive in modifying the apparatus of D1 in order to substitute a support mounted at the end of a hollow spindle mounted onto a slide member for the robot arm described.

The subject-matter of claim 1 does therefore involve an inventive step (Article 33(3) PCT).

**Dependent claims 2 to 9**

These claims are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

**2. Lack of novelty**

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of the following claims is not new in the sense of Article 33(2) PCT.

**Independent apparatus claim 10**

The document D1 discloses (the references in parentheses applying to this document);  
- A method for automatically measuring the external and internal profile of metal pipes ends (title and fig. 9), comprising detecting the distance data of sensors respectively from an external generatrix and the corresponding internal generatrix at the end of the pipe to be measured ("lasers (163, 166, 173, 176)", "outer surface" in col. 7, l. 50-52, col. 7, l. 8-9 and col. 8, l. 8-9 and "inner surface"), the sensors being rotatable around an axis parallel and next to the axis of the pipe ("bracket (25)" in fig. 9, col. 7, l. 58-62 and col. 8, l. 6-8), the distance data detected in correspondence of each polar coordinate acquired by means of an encoder being sent to the inlet of a data processor for generating a classification code of the profile, based on the processing of the detected data ("program" in col. 8, l. 8-10 and "wrist encoder (78)" in col. 3, l. 37-39 and col. 8, l. 10-13).

Hence, D1 discloses all the features of present claim 10.

**Dependent claim 11**

The feedback control is known from D1 (col. 1, l. 8-12).

**3. Lack of inventive step**

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of the following claims does not involve an inventive step in the sense of

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REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

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Article 33(3) PCT.

**Dependent claim 12** does not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, see documents D1 and D3 and the corresponding passages cited in the search report.

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## CLAIMS

1. An apparatus for measuring the internal and external profile of metal pipes at the ends thereof, comprising at least a pair of sensors (11a, 11b) suitable for measuring the distance from the external and from the internal profile respectively of the pipe (1) kept in a fixed position, with said sensors mounted on a support (10) orthogonal to the theoretical axis (X-X) of the pipe (1) and rotatable around its axis of rotation, there being provided means for carrying vertically said axis of rotation next to said axis (X-X) and means suitable for recording the measure data taken for each polar coordinate relevant to the instantaneous angular position of said sensors (11a, 11b) during the rotation of said support (10) driven by motor means (21), in correspondence of means (20) suitable for detecting said angular position, characterized in that said support (10) of the sensors (11a, 11b) is mounted at the end of an internally hollow spindle or sleeve (12) which is driven at the opposite end by means (21, 22, 22a) in order to be drawn into rotation with respect to a slide member (13) vertically movable for changing the height of the axis of rotation thereof and slidable in a direction parallel to said axis.
2. An apparatus according to claim 1, characterized in that said sensors (11a, 11b) are radially movable on said support (10) in order to regulate their distance from the center of the support itself and therefore from said axis (X-X) of the pipe (1) as a function of the size of diameter and thickness of the pipe itself.
3. An apparatus according to claim 1 or 2, characterized in that said slide (13) is supported on a platform (14) with respect to which it is slidable in a direction parallel to the axis of rotation thereof, along guides (13a) integral with said platform (14).
4. An apparatus according to claim 3, characterized in that said platform (14) supporting the slide (13) is vertically movable being mounted at the top of four mechanical jacks (15, 15a, 15b, 15c) at the four corners of the substantially rectangular shape thereof, said jacks being driven by a single motor (24) by means of angular drive transmission gears (25).

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5. An apparatus according to claim 3 or 4, characterized in that two guiding columns (26, 26a) are provided at two opposite corners at the ends of an ideal diagonal, at the center of which said platform is mounted at the top of the piston (16a) of a pneumatic cylinder (16) suitable for ensuring the maintenance of the achieved vertical position.
6. An apparatus according to claim 1, characterized in that said slide (13) is driven, for its horizontal sliding, by means of an electromechanical jack (17) mounted with the driving member thereof (27) on said platform (14) and integral with the slide (13) by means of brackets (18).
- 10 7. An apparatus according to claim 2, characterized in that said sensors (11a, 11b) are slidably mounted along slides (31a, 31b) integral with said board (10), having a round shape, substantially parallel to a diameter thereof, and are driven by means of respectively independent motors (28a, 28b) so as to slide in correspondence of the diameter to which said slides are parallel between a position coincident with axis (X-X) for the internal sensors (11b) and a peripheric position for the external sensors (11a) at a distance from said axis which is higher than the radius of the external profile for the pipe having the maximum diameter which is to be measured.
- 15 8. An apparatus according to one or more of the previous claims, characterized in that said jacks for the vertical movement (15, 15a, 15b, 15c) and horizontal movement (17) of the rotation axis of said support (10) as well as the distance regulation members (28a, 28b) of the two sensors (11a, 11b) along a diameter of the support are ball screw jacks with backlash compensation.
- 20 9. An apparatus according to claim 1, characterized in that inside the hollow spindle or sleeve (12) are passing the cables and the conduits for supplying said sensors (11a, 11b) and said respective regulation motors, as well as for transmitting the detected measures to a data processing system, in combination with the relevant polar coordinates taken from said impulse generator (20).
- 25 10. A method for automatically measuring the external and internal profile of metal pipes at the ends thereof, characterized in that it comprises detecting the distance data of sensors (11a, 11b) respectively from an external

generatrix and the corresponding internal generatrix at the end of the pipe (1) to be measured, kept in a fixed position, said sensors being rotatable around an axis parallel and next to the axis (X-X) of the pipe, the distance data detected in correspondence of each polar coordinate acquired by means of an impulse generator or encoder (20) being sent to the inlet of a data processor for generating a classification code of the profile, based on the processing of the detected data.

5 11. A method according to claim 10, characterized in that the processed measure data are fed to the inlet of a feedback control system of the pipe production.

10 12. A method according to claim 10, characterized in that it is provided with optimization algorithms of the couplings between ends of pipes, with respect to the relevant angular positions.